SERVICE MANUAL

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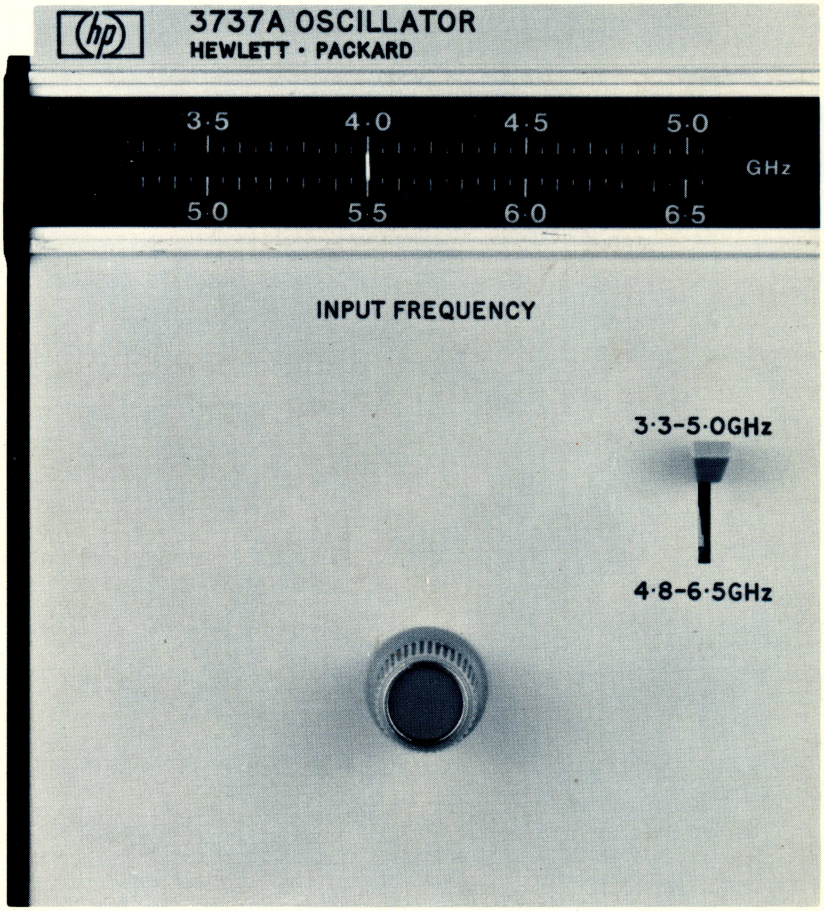
PLEASE INCLUDE MANUAL AND ACCESSORIES WHEN RETURNING EQUIPMENT.
Leasametric
7040 TORBRAM RD. NO.17, MISSISSAUGA, ONT.

OSCILLATOR
3737A



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SERVICE MANUAL

OSCILLATOR

3737A

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1234U.

For instruments with serial prefixes other than this refer to the Manual Change Sheets.

For additional information about serial numbers, see Section I.

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SOUTH QUEENSFERRY, WEST LOTHIAN, SCOTLAND

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FOREWORD

The 3737A Oscillator is a plug-in module for the Hewlett-Packard Model 3730A Down Converter. This manual contains service information for just the Oscillator. A separate service manual is available for the Down Converter. Combined operating instructions for the Oscillator and Down Converter are also available.

These publications are also available in 6in x 4in microfiche form. Each sheet contains up to 60 pages, maximum, of text and illustrations.

Order any of these publications through your nearest Hewlett-Packard Office (addresses are given at the rear of this manual), quoting the complete number, name, and serial number of your Oscillator and/or Down Converter.

SERVICE MANUAL CONTENT

Section I contains General Information on the 3737A. Included are details on Serial Numbers, a Description of the 3737A, a Table of Specifications, and a list of Recommended Test Equipment.

Section II gives a detailed Performance Test to enable the user to check that his Oscillator is functioning correctly and within the limits of its specification.

Section III details the procedure for calibrating the Oscillator.

Section IV contains a Replaceable Parts List for the Oscillator, a list of Reference Designators used in the parts list and schematic, and a list of Abbreviations used in the parts list.

Section V contains Service information, including Repair details, Theory of Operation, Troubleshooting, Circuit Description, Component Location information, and an overall Schematic of the 3737A.

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Figure 1-1 Model 3737A Oscillator

SECTION I
GENERAL INFORMATION

1-1 INTRODUCTION

1-2 The Model 3737A Oscillator is a plug-in instrument for the Hewlett-Packard Model 3730A Down Converter. This manual provides service information for just the 3737A Oscillator.

1-3 The manual is divided into five sections, each covering a specific topic or aspect of the instrument. The content of each section is summarized on Page ii of this manual. The schematic is located at the back of Section V and can be unfolded and used for reference while reading any other part of the manual.

1-4 This section contains a description of the 3737A, the instrument specifications (see Table 1-1), and a list of recommended test equipment for performance testing, calibrating and troubleshooting the 3737A (see Table 1-2).

Table 1-1 Table of Specifications

SPECIFICATIONS

FREQUENCY

Ranges
Two frequency ranges, switch selectable:

a. 3.3 to 5.0GHz.
b. 4.8 to 6.5GHz.

Accuracy
Scale accuracy: ±20MHz at 25°C (77°F).

POWER REQUIREMENTS

Power for the Oscillator is supplied by the 3730A Down Converter.

20V dc: 270mA.
-15V dc: 270mA.

GENERAL

Ambient Temperature Range
0 to 50°C (32 to 122°F).

Weight
Net: 3.75lb (1.7kg)
Shipping: 6.75lb (3.1kg).

1-5 SERIAL NUMBERS

1-6 Instrument Identification

1-7 The instrument serial number is on a plate on the top of the 3737A. The serial number is of the form - - - -U- - - -; the number preceding the letter is the serial prefix and the number after the letter is unique to the particular instrument.

1-8 In *all* communications regarding the instrument, quote the ***complete*** serial number.

1-9 Instruments Covered by Manual

1-10 The contents of this manual apply directly to instruments having the same serial number prefix as listed after SERIAL NUMBERS on the title page (Page i).

1-11 Important information for correcting errors and for updating the contents of this manual to cover improvements to the instrument that occur after the printing of this manual is provided, if required, in a Manual Changes supplement supplied with this manual.

1-12 For information concerning instruments with a serial number prefix not listed on the title page or in a Manual Changes supplement, contact the nearest Hewlett-Packard office (addresses are given at the rear of this manual).

1-13 DESCRIPTION

1-14 The Model 3737A Oscillator is a YIG (yttrium iron garnet) tuned transistor oscillator. It has been designed as a plug-in oscillator for the Hewlett-Packard Model 3730A Down Converter.

1-15 The 3730A down converts RF to IF by mixing the RF input with a signal of almost the same frequency supplied by the Oscillator. The frequency of the IF output from the Down Converter is equal to the difference in frequency between the RF input and the Oscillator output and can be in the range 45 to 95MHz.

1-16 Normally the IF output is centred on 70MHz and an automatic frequency control (AFC) feature in the 3730A can be switched on to prevent the IF output centre frequency drifting from 70MHz. When the AFC switch is on, a signal from the Down Converter tunes the Oscillator output frequency to compensate for any drift changes in the RF input frequency.

1-17 RECOMMENDED TEST EQUIPMENT

1-18 Table 1-2 lists the recommended test equipment required to carry out the performance tests of Section II, the adjustment procedures of Section III, and the troubleshooting of Section V.

Table 1-2 Recommended Test Equipment

Instrument Type	Critical Specifications	Suggested Model	Use*
Test Oscillator	RF output: 3.3 to 6.5GHz	*hp* 8605A	P.A.
Counter	Input: 0 to 6.5GHz	*hp* 5245A + *hp* 5257A	P.A.
Voltmeter	20V	*hp* 3440A + *hp* 3442A	T.
Power Meter	3.3GHz to 6.5GHz	*hp* 8478B	T.
Attenuator	10dB	*hp* 8491A	T.
Cable	Unique	*hp* 15558A	T.

* P. Performance Tests A. Adjustments T. Troubleshooting

SECTION II
PERFORMANCE TESTS

2-1 INTRODUCTION

2-2 The procedure in this section tests the instrument's electrical performance using the specifications of Table 1-1 as the performance standards. The tests can be performed without access to the interior of the instrument.

2-3 EQUIPMENT REQUIRED

2-4 Equipment required for the performance tests is listed in the Recommended Test Equipment table in Section I of this manual. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended models.

2-5 TEST RECORD

2-6 Results of the performance tests may be tabulated on the Test Record below. The Test Record gives the tested specifications and the acceptable limits. Test results recorded at Incoming Inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments.

Table 2-1 Test Record

3737A Oscillator
Serial Number ----U-----

Tested by .....
Date .....

Paragraph	Test	Results (GHz)		
		Minimum	Actual	Maximum
2-7	FREQUENCY ACCURACY TEST Specification: Scale accuracy ±20MHz at 25°C			
	Pointer set to (a) 3.3GHz	3.280		3.320
	(b) 3.5GHz	3.480		3.520
	(c) 4.0GHz	3.980		4.020
	(d) 4.5GHz	4.480		4.520
	(e) 5.0GHz	4.980		5.020
	(f) 5.5GHz	5.480		5.520
	(g) 6.0GHz	5.980		6.020
	(h) 6.5GHz	6.480		6.520

2-7 FREQUENCY ACCURACY TEST

Specification:

Scale accuracy: ±20MHz at 25°C

Description

This test measures the accuracy of the input frequency scale on the Oscillator. The test is performed by setting the Down Converter (and Oscillator) for an RF input frequency of 3.3GHz, setting the test oscillator to the same frequency, and then fine tuning the test oscillator to give a 70MHz IF output from the Down Converter. The test oscillator output frequency is then measured using the counter. This procedure is repeated for various RF input frequencies within the range of the Oscillator.

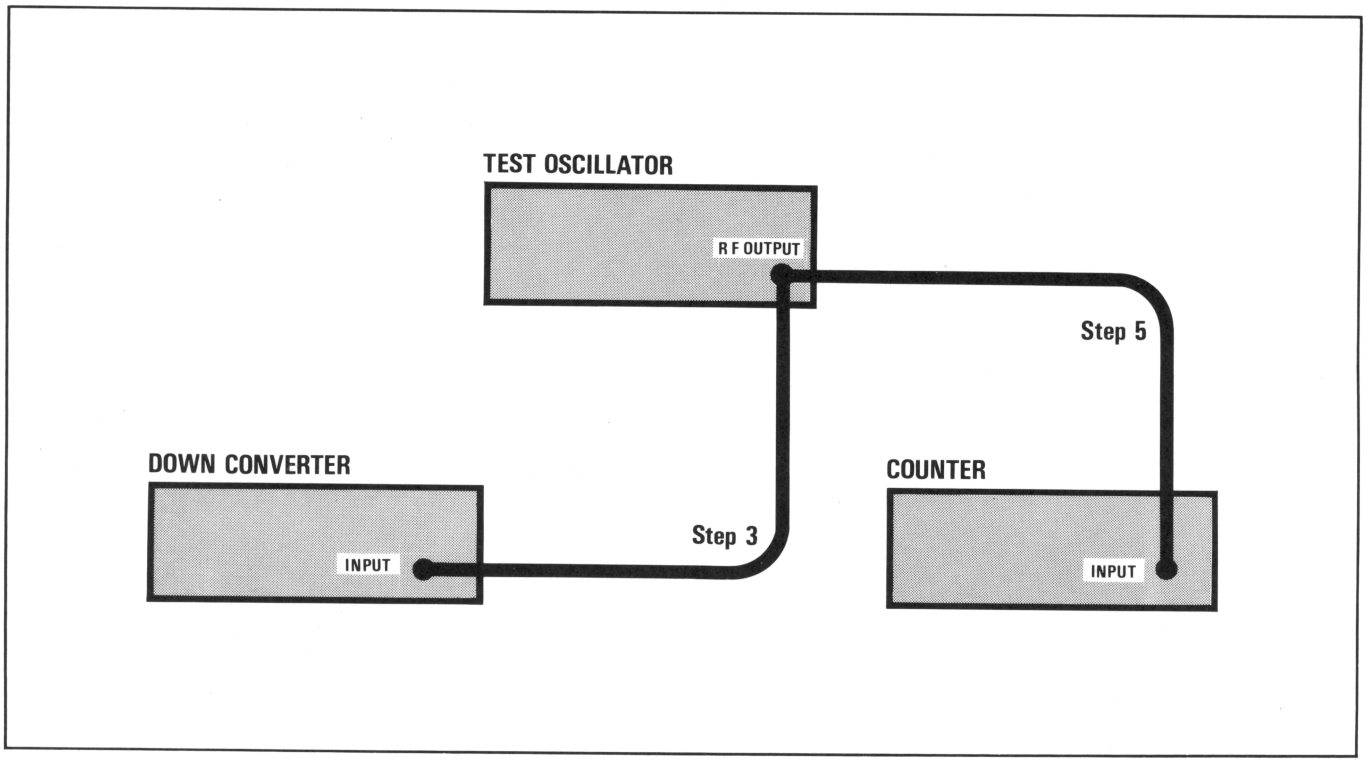


Figure 2-1 Equipment Setup for Frequency Accuracy Test

Procedure

1. Set the Down Converter and Oscillator controls as follows:

   AFC ..... OFF
   INPUT FREQUENCY 3.3GHz

2. Switch on the Down Converter, test oscillator and counter, and allow at least 15 minutes warm-up time.

3. Connect the test oscillator RF output to the Down Converter RF input, as shown in the set-up diagram Figure 2-1.

4. Set the test oscillator RF output to 3.3GHz and fine tune the frequency for a 3730A IF CENTRE MHz meter reading of 70MHz. Confirm the correct input frequency by setting the AFC switch to ON and checking that the meter reading remains at 70MHz. If it does not, reset the AFC switch to OFF and readjust the test oscillator RF output to give another 70MHz tuning point. Confirm the correct input frequency as before. Then reset the AFC switch to OFF.

5. Disconnect the test oscillator RF output from the Down Converter and connect it to the counter as shown in the set-up diagram Figure 2-1.

6. Measure the test oscillator RF output frequency – it should be 3.3GHz ±20MHz.

7. Repeat steps 3 to 6 at other frequencies within the range of the Oscillator and check that in every case the test oscillator frequency is within ±20MHz of the 3737A INPUT FREQUENCY setting.

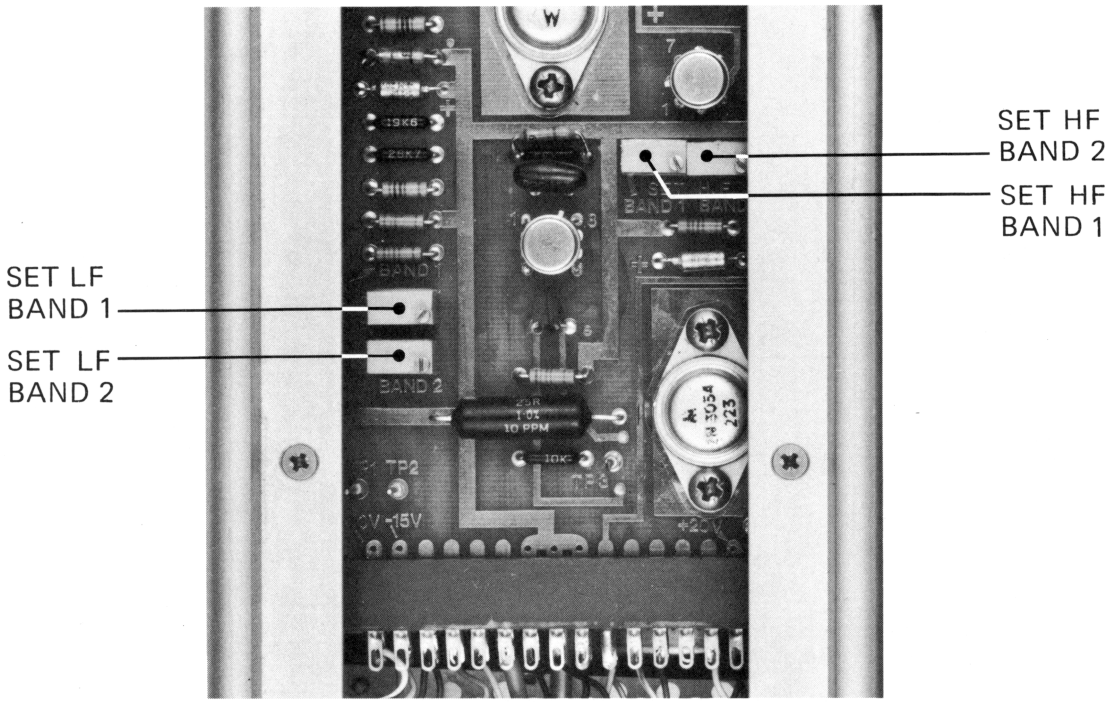


Figure 3-1 Location of Adjustments

SECTION III
ADJUSTMENTS

3-1 INTRODUCTION

3-2 This section contains information on calibrating the end points on both scales of the Oscillator. Since the procedures for the four adjustments are similar, a comprehensive procedure to cover all four is presented.

3-3 Perform the adjustments in the order indicated in Paragraph 3-8.

3-4 The Oscillator is a plug-in instrument and its performance is dependent on the mainframe, ie the Down Converter. For this reason, before performing any of the adjustments detailed in this section check that the Down Converter is fully calibrated. Also allow adequate warm-up time for all the equipment.

3-5 The locations of the adjustments within the Oscillator are shown in Figure 3-1.

3-6 EQUIPMENT REQUIRED

3-7 All the test equipment required to carry out the adjustments detailed in this section is listed in the Recommended Test Equipment table in Section I of this manual. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended models.

3-8 RELATED ADJUSTMENTS

3-9 The four adjustments detailed in this section are:

a. LF (low frequency) Band 1.

b. HF (high frequency) Band 1.

c. LF Band 2.

d. HF Band 2.

Band 1 adjustments are independent of those of Band 2 and can be performed separately. However, the adjustments within a band are interdependent and should be performed in the order LF then HF.

3-10 ADJUSTMENT LOCATIONS

3-11 Figure 3-1 shows the locations of the adjustments within the Oscillator.

3-12 FREQUENCY ADJUSTMENT

Description

The procedure detailed below applies to each of the four adjustments:

a. LF Band 1.

b. HF Band 1.

c. LF Band 2.

d. HF Band 2.

The control settings given apply to all four adjustments except where otherwise indicated.

The adjustment calibrates an end point on the input frequency indicator on the Oscillator. For this a test oscillator is set to the same frequency as that shown on the Oscillator and then connected to the Down Converter RF input. An internal control in the Oscillator is then adjusted to give a 70MHz IF output from the Down Converter.

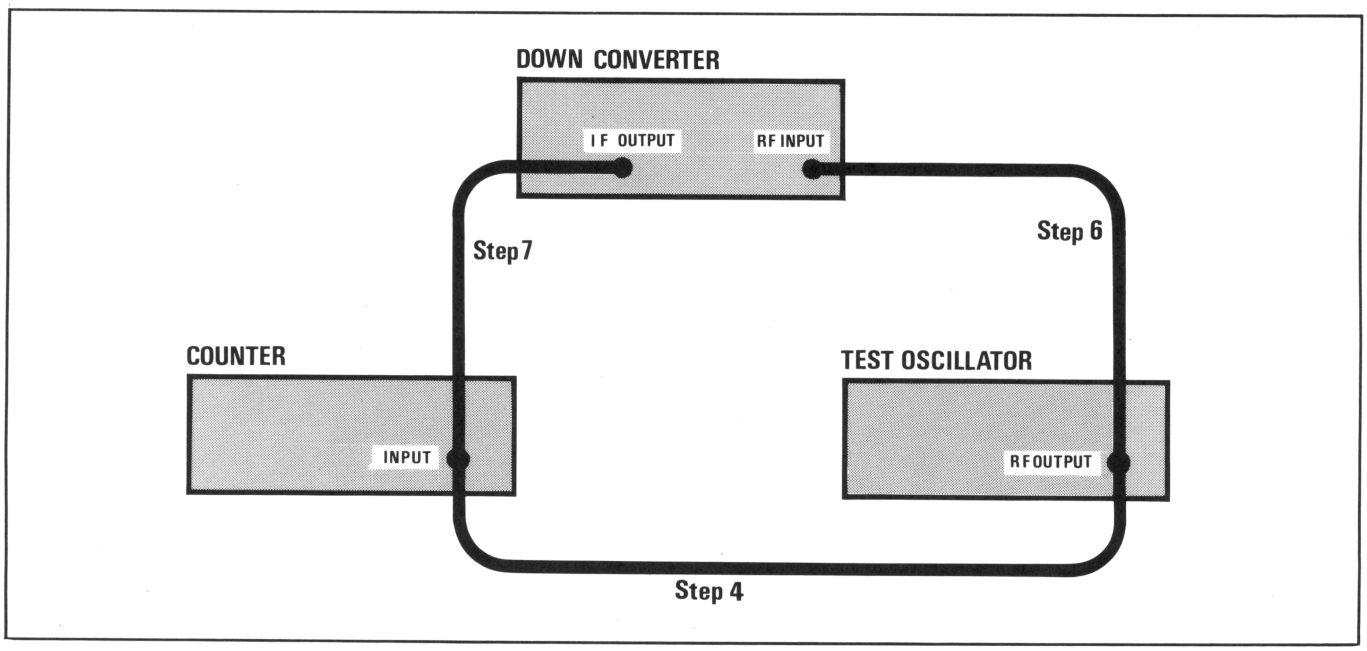


Figure 3-2 Equipment Setup for Frequency Adjustment

Procedure

1. Remove the top panels from the Oscillator and Down Converter. Plug the Oscillator into the Down Converter.

2. Set the Oscillator and Down Converter controls as follows:

AFC .. .. OFF
INPUT FREQUENCY .. .. (a) 3.3GHz
(b) 5.0GHz
(c) 4.8GHz
(d) 6.5GHz

3. Switch on the Down Converter, test oscillator, and counter and allow at least 15 minutes warm-up time.

DANGER

115/230V AC WIRES ARE EXPOSED WHEN THE TOP PANEL OF THE DOWN CONVERTER IS REMOVED. USE EXTREME CAUTION DURING ADJUSTMENTS.

4. Connect the test oscillator RF output to the counter, as shown in the set-up diagram, Figure 3-2.

5. Set the test oscillator RF output to (a) 3.3GHz ±100kHz
   (b) 5.0GHz ±100kHz
   (c) 4.8GHz ±100kHz
   (d) 6.5GHz ±100kHz

6. Disconnect the test oscillator RF output from the counter and connect it to the Down Converter RF input, as shown in the set-up diagram, Figure 3-2.

7. Connect the Down Converter IF output to the counter input, as shown in the set-up diagram, Figure 3-2.

8. Adjust the internal potentiometer in the Oscillator (see Figure 3-1) to give a 70MHz ±1MHz reading on the counter. The 3730A IF CENTRE MHz meter will also indicate 70MHz. Note: more than one setting of the potentiometer will give a 70MHz reading. Step 9 of this procedure checks that the correct setting has been obtained.

9. Set the 3730A AFC switch to ON. Check that the IF output remains at 70MHz. If it does not, repeat steps 8 and 9 with a different setting of the potentiometer for a 70MHz output.

10. Replace the Oscillator and Down Converter top panels.

SECTION IV
REPLACEABLE PARTS

4-1 INTRODUCTION

4-2 This section contains information for ordering replacement parts. Table 4-1 lists parts in alpha-numerical order of their reference designators and gives the following information for each part:

a. Hewlett-Packard number.

b. Total quantities of each part used in the instrument. When TQ occurs in the description, the total quantity is given by the product of the number in the TQ column and the TQ number. Otherwise, the total quantity is as given in the TQ column. Note that the total quantity is given only the first time any component appears in the parts list.

c. Description — a list of abbreviations used is given overleaf.

d. Typical manufacturer and manufacturer's part number — a code list of manufacturers is given at the end of this section.

4-3 ORDERING INFORMATION

4-4 To order a replacement part, address the order or enquiry to your Hewlett-Packard Sales and Service Office — a list of addresses is given at the end of this manual.

4-5 Specify the following information for each part.

a. Model and full serial number of instrument.

b. Hewlett-Packard part number.

c. Circuit reference designator.

d. Description.

4-6 To order a part not listed in the tables, give a complete description of the part, including its function and location in the instrument.

4-7 LOCATION OF PARTS

4-8 Figure 4-1 locates mechanical and miscellaneous parts of the 3737A. For the location of electrical components, refer to Section V.

4-9 REFERENCE DESIGNATORS

A	=	assembly
C	=	capacitor
CR	=	diode
E	=	miscellaneous electrical part
IC	=	integrated circuit
J	=	connector
MP	=	miscellaneous mechanical part
Q	=	transistor
R	=	resistor
S	=	switch
TP	=	test point
W	=	cable
XA	=	printed circuit board edge connector
Z	=	attenuator
ZZ	=	packaging material

4-10 COLOUR ABBREVIATIONS

BLK	=	black (0)
BRN	=	brown (1)
RED	=	red (2)
ORN	=	orange (3)
YEL	=	yellow (4)
GRN	=	green (5)
BLU	=	blue (6)
VIO	=	violet (7)
GRY	=	grey (8)
WHT	=	white (9)
SILV	=	silver

4-11 DESCRIPTION ABBREVIATIONS

AMPL	=	amplifier
ATTEN	=	attenuator
ASSY	=	assembly
BD	=	board
BHD	=	bulkhead
BKDN	=	breakdown
CBL	=	cable
COAX	=	coaxial
CONHEX	=	connector type
CONN	=	connector
DB	=	decibel
DIO	=	diode
DPDT	=	double pole, double throw
FXD	=	fixed
GHZ	=	gigahertz (10^9 hertz)
IC	=	integrated circuit
K	=	kilo (10^3)
LIN	=	linear
LT	=	left
LVR	=	lever
MT	=	mount
MTG	=	mounting
MW	=	milliwatt (10^{-3} watt)
NSR	=	not separately replaceable
OPER	=	operational
OSC	=	oscillator
PC	=	printed circuit
PF	=	picofarad (10^{-12} farad)
PNL	=	panel
RF	=	radio frequency
RT	=	right
RTRY	=	rotary
SCR	=	screw
SI	=	silicon
SKT	=	socket
SMA	=	connector type
ST	=	select on test
SW	=	switch
S/R	=	semi-rigid
TQ	=	total quantity
UF	=	microfarad (10^{-6} farad)
V	=	volt
VAR	=	variable
W	=	watt
WVDC	=	working volts direct current
XSTR	=	transistor
YIG	=	yttrium iron garnet

Table 4-1 Replaceable Parts

Ref Desig	HP Part No	TQ	Description	Mfr	Mfr Part No
	03737-95000	1	MANUAL SERVICE 3737A	E0007	
E1	03737-70102	1	ASSY OSC YIG	E0007	
	0960-2112	1	OSC YIG 3.3-6.5GHZ	28480	
	03736-30110	1	MT YIG FRONT	E0007	
	03736-30111	1	MT YIG REAR	E0007	
	03736-30113	1	SCR MT YIG #TQ2#	E0007	
J1			REFER TO W1		
J2			REFER TO W3		
J3			REFER TO W3		
MP1	03737-10001	1	PNL FRONT	E0007	
	03731-10002	1	PNL SUB	E0007	
MP2	03731-10003	1	PNL REAR	E0007	
MP3	03736-10006	1	PNL TOP	E0007	
MP4	03736-10003	1	PNL BOTTOM	E0007	
MP5	03736-10005	1	PNL SIDE RT	E0007	
	03731-30030	1	GUIDE RT	E0007	
MP6	03736-10004	1	PNL SIDE LT	E0007	
	03731-30015	1	GUIDE LT	E0007	
MP7	03736-30103	1	ROD EXTRUSION TOP RT	E0007	
	03731-30022	4	RUNNER REAR	E0007	
MP8	03736-30102	1	ROD EXTRUSION TOP LT	E0007	
	03731-30022		RUNNER REAR	E0007	
MP9	03736-30105	1	ROD EXTRUSION BOTTOM RT	E0007	
	03731-30021	2	RUNNER FRONT	E0007	
	03731-30022		RUNNER REAR	E0007	
MP10	03736-30104	1	ROD EXTRUSION BOTTOM LT	E0007	
	03731-30021		RUNNER FRONT	E0007	
	03731-30022		RUNNER REAR	E0007	
MP11	03731-10006	1	HANDLE LATCH	E0007	
	03731-30023	1	PIVOT LATCH	E0007	
	03731-30024	1	SPACER LATCH	E0007	
	03731-10011	1	SPRING LATCH	E0007	
MP12	03737-30101	1	EXTRUSION PNL FRONT	E0007	
	03737-70101	1	ASSY SCALE	E0007	
	03731-30002	1	WINDOW	E0007	
	03731-50001	1	POINTER	E0007	
	03731-10015	1	LOCK WINDOW LT	E0007	
	03731-10016	1	LOCK WINDOW RT	E0007	
	03731-30025	1	PULLEY #TQ2#	E0007	
	03731-30009	1	ROLLER #TQ2#	E0007	
	7120-0607	1	PLATE SERIAL	E0007	
R1	2100-3283	1	R VAR 5K OHM LIN 10 TURN #INPUT FREQUENCY#	73138 8106	
	0370-1089	1	KNOB JADE GRY	28480	
	03731-30007	1	BEARING PNL	E0007	
	1430-0755	1	GEAR 20 TEETH	E0007	
	03731-30006	3	BEARING BUSH	E0007	
	03736-30106	1	COUPLER	E0007	
	03731-30004	1	AXLE LOWER	E0007	
	03736-10002	1	PLATE STOP	E0007	
	03736-30109	1	BAR STOP	E0007	
	03731-30006		BEARING BUSH	E0007	
	03736-70100	1	ASSY GEAR BOBBIN	E0007	

Abbreviations are listed in the introduction to this section

Table 4-1 Replaceable Parts (continued)

Ref Desig	HP Part No	TQ	Description	Mfr	Mfr Part No
	03736-30108	1	BOBBIN 10 TURN	E0007	
	03731-30017	1	GEAR DISC 120 TEETH	E0007	
	03731-30006		BEARING BUSH	E0007	
	03736-30107	1	AXLE UPPER	E0007	
	03731-30010	1	BAR MTG #TQ2#	E0007	
	03731-10007	1	PLATE MTG	E0007	
S1	3100-0666	1	SW LVR ACTUATED RTRY DPDT #3.3-5.0GHZ/4.8-6.5GHZ#	28480	
	0370-0929	1	KNOB LVR #S1#	14493	0370-0929
W1	03736-70104	1	ASSY CBL MAIN	E0007	
	1251-2774	1	CONN MULTI BHD MTG 5-WAY #J1#	71468	DEMSWIP
	1251-0159	1	CONN MULTI BHD MTG 2X15-WAY #XA1#	71785	251-15-30-261
	1251-1115	1	KEY POLARIZING #XA1#	71785	456-07-35-003
W2	03736-70103	1	ASSY CBL	E0007	
W3	03736-70102	1	ASSY COAX CBL	E0007	
	03736-30112	1	CBL COAX S/R	E0007	
	1250-1341	1	CONN COAX RT ANGLE SMA 50 OHM #J3#	16179	OSM221-1
	1250-1317	1	CONN COAX BHD MTG #RF# CONHEX #J2#	98291	51-0090-9703+4220MOD
	03731-30014	1	HOUSING SKT #J2#	E0007	
Z1	8493A-003	1	ATTEN 3DB	28480	
ZZ1	9211-0309	1	CARTON CORRUGATED	E0007	
ZZ2	9211-0180	1	BOX TRANSIT	E0007	
A1	03737-70001	1	ASSY YIG DRIVER	E0007	
	03737-30001	1	PC BD BLANK #NSR#	E0007	
	0380-0779	1	PILLAR #TQ4#	71279	1300-14
A1C1			NOT ASSIGNED		
A1C2	0180-0155	4	C FXD 2.2UF 20% 20WVDC	56289	150D225X0020A2-DYS
A1C3	0180-0155		C FXD 2.2UF 20% 20WVDC	56289	150D225X0020A2-DYS
A1C4	0180-0155		C FXD 2.2UF 20% 20WVDC	56289	150D225X0020A2-DYS
A1C5	0180-0155		C FXD 2.2UF 20% 20WVDC	56289	150D225X0020A2-DYS
A1CR1	1902-3169	1	DIO BKDN 10.7V 2% 400MW	07910	CD 35716
A1CR2	1902-3203	1	DIO BKDN 14.7V 5% 400MW	07910	CD35754
A1CR3	1902-0680	1	DIO BKDN 6.2V 5% 400MW	12954	1N827
A1IC1	1826-0021	1	IC VOLTAGE FOLLOWER	12040	SL11611
A1IC2	1826-0043	1	IC OPER AMPL	12040	SL12795
A1Q1	1854-0071	1	XSTR SI NPN	01295	SKA1124
	1200-0076	2	INSULATOR XSTR	02735	DF 14A
A1Q2	1854-0072	1	XSTR SI NPN	02735	2N3054
A1Q3	1853-0052	1	XSTR SI PNP	04713	2N3740
	1200-0076		INSULATOR XSTR	02735	DF 14A
A1R1	0698-3432	1	R FXD 26.1 OHM 1% 1/8W	19701	MF4CT-0
A1R2	0757-0200	1	R FXD 5.62K OHM 1% 1/8W	19701	MF4C
A1R3	2100-3286	3	R VAR 10K OHM 10% 1/2W	73138	66W
A1R4	2100-3089	1	R VAR 5K OHM 10% 1/2W LIN 20-TURN	73138	66W
A1R5	2100-3286		R VAR 10K OHM 10% 1/2W	73138	66W
A1R6	2100-3286		R VAR 10K OHM 10% 1/2W	73138	66W
A1R7	0757-0442	1	R FXD 10K OHM 1% 1/8W	19701	MF4C
A1R8	0698-8251	1	R FXD 28.7K OHM 1% 1/8W	19701	MF4CT-13
A1R9	0698-8261	1	R FXD 19.6K OHM 1% 1/8W	19701	MF4CT-13
A1R10	0698-8320	1	R FXD ST NOM VAL 49.9K OHM 1% 1/8W	19701	MF4C,T-13
A1R11	0757-0438	1	R FXD 5.11K OHM 1% 1/8W	19701	MF4CT-0
A1R12	0698-8319	1	R FXD 10K OHM 1% 1/8W		

Abbreviations are listed in the introduction to this section

Table Replaceable Parts (continued)

Ref Desig	HP Part No	TQ	Description	Mfr	Mfr Part No
A1R13	0698-8262	1	R FXD 25 OHM 1% 1W	19701	MF7T-13
A1R14	0757-0199	1	R FXD 21.5K OHM 1% 1/8W	19701	MF4CT-0
A1R15	0698-3132	1	R FXD 261 OHM 1% 1/8W	19701	MF4CT-0
A1R16	0757-0417	1	R FXD 562 OHM 1% 1/8W	19701	MF4CT-0
A1R17	0757-0280	1	R FXD 1K OHM 1% 1/8W	75042	CEAT-0

Abbreviations are listed in the introduction to this section

Table 4-2 Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name). Alphabetical codes have been arbitrarily assigned to manufacturers not appearing in the H4 handbooks.

Code No	Manufacturer	Address
01295	TEXAS INSTRUMENTS INC.	DALLAS TEXAS
02735	R.C.A. SEMICONDUCTOR DIV.	SOMERVILLE N.J.
04713	MOTOROLA SEMICON. PROD. INC.	PHOENIX ARIZ.
07910	CONTINENTAL DEVICE CORP.	HAWTHORNE CALIF.
12040	NAT. SEMICONDUCTOR CORP.	DANBURY CONN.
12954	DICKSON ELEC. CORP.	SCOTTSDALE ARIZ.
14493	HEWLETT-PACKARD CO.	LOVELAND COLO.
16179	OMNI-SPECTRA INC.	SOUTHFIELD MICH.
19701	ELECTRA MFG. CO.	INDEPENDENCE KANS.
28480	HEWLETT-PACKARD CO.	PALO ALTO CALIF.
56289	SPRAGUE ELECTRIC CO.	ADAMS MASS.
71279	CAMBRIDGE THERMIONIC CORP.	CAMBRIDGE MASS.
71468	ITT CANNON ELECTRIC INC.	LOS ANGELES CALIF.
71785	CINCH MFG. CO.	CHICAGO ILL.
73138	BECKMAN INSTRUMENTS INC.	FULLERTON CALIF.
75042	I.R.C. DIV. OF TRW INC.	PHILADELPHIA PA.
98291	SEALECTRO CORP.	MAMARONECK N.Y.
E0007	HEWLETT-PACKARD LTD.	SOUTH QUEENSFERRY WEST LOTHIAN

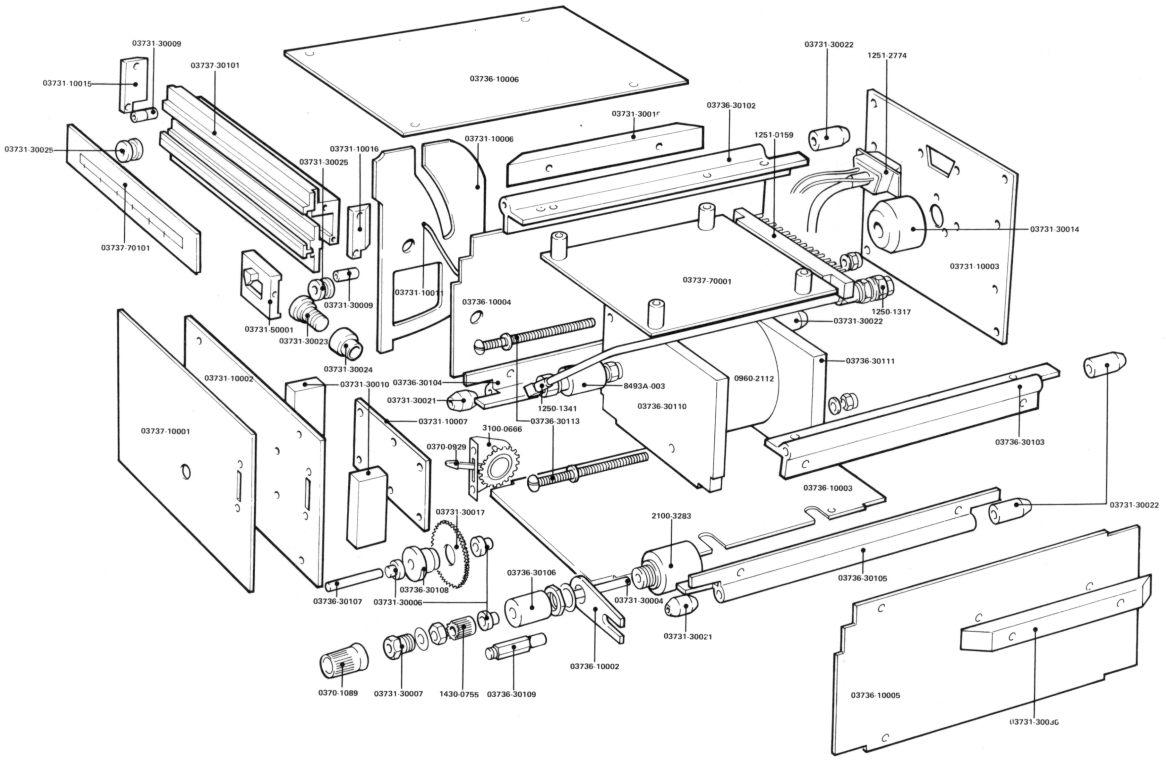


Figure 4-1 Location of Parts

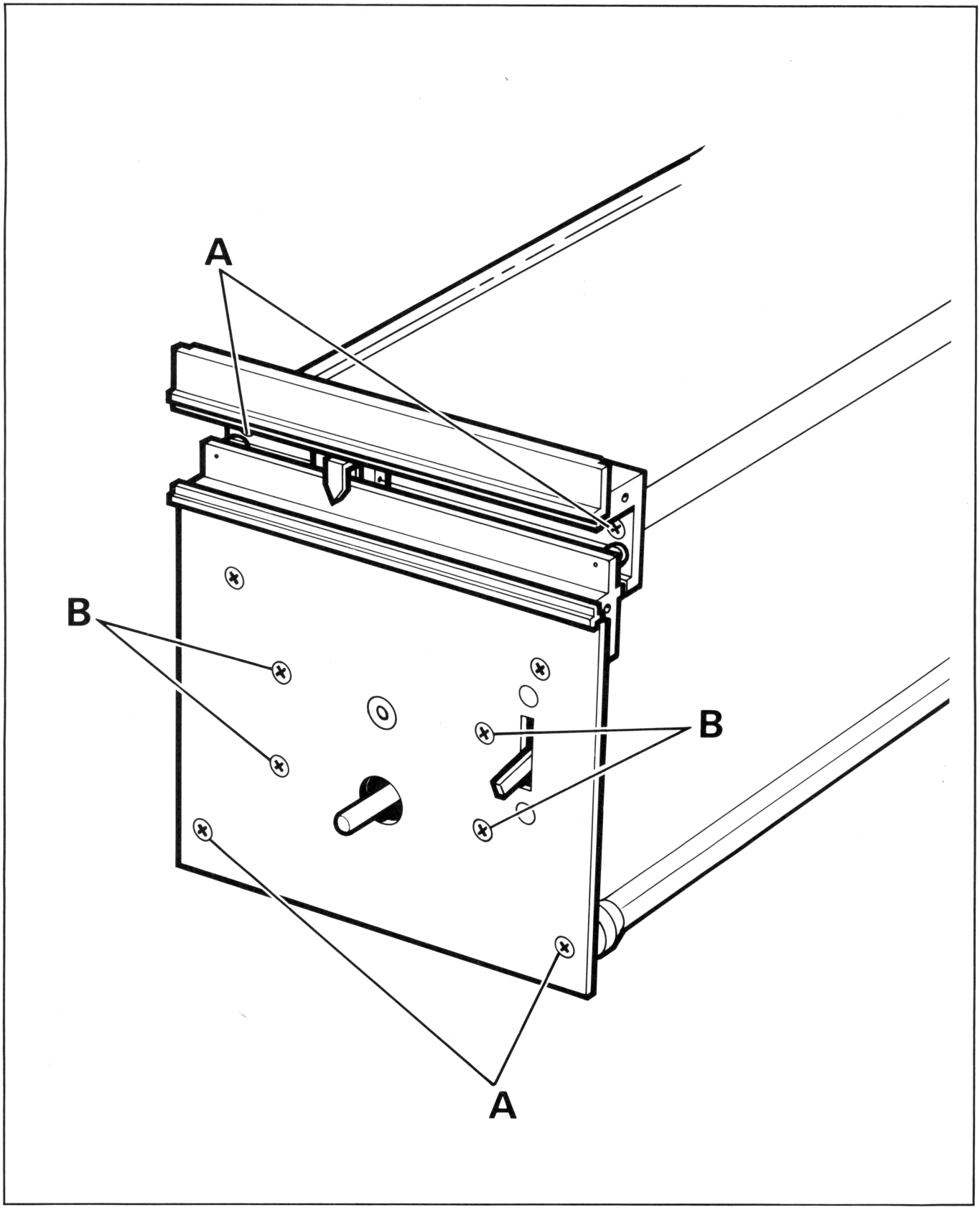


Figure 5-1 Sub-panel/Extrusion Assembly

SECTION V
SERVICE

5-1 INTRODUCTION

5-2 This section contains service information for the Oscillator. Theory of operation, troubleshooting and repair details are also included. The schematic is at the end of the section.

5-3 Principles of Operation

5-4 Complete details on the operation of the Oscillator down to component level are contained in this section. General information concerning the theory behind the operation is covered by the Theory of Operation subsection. Particular information, down to component level, is dealt with by the Circuit Description and Schematic.

5-5 Troubleshooting

5-6 Troubleshooting deals only with Oscillator faults and the procedure depends on the Down Converter functioning correctly. The procedure consists of signal measurements under set conditions

5-7 REPAIRS

5-8 Restringing the Pointer

5-9 The frequency indicator pointer is cord driven by the INPUT FREQUENCY potentiometer. If the cord breaks or is damaged in any way, renew it using the procedure detailed below:

1. Remove the top and bottom panels and both side panels.

2. By slackening the grub screw at the rear of the coupling, remove the potentiometer from the drive shaft coupling. There is no need to unsolder the wiring to the potentiometer.

3. Remove the front panel knobs. The lever switch knob is a push fit and the potentiometer knob is held by two grub screws. Also remove the washers from the potentiometer drive shaft.

4. Remove the front panel. It is held in place by the panel bearing.

5. Remove the lever switch from the sub-panel. There is no need to unsolder the wiring to the switch.

6. Remove one of the window locks. Remove the two set screws from the rear of the front panel extrusion and slide the window out. Then remove the other window lock.

7. Remove the sub-panel/extrusion assembly by unscrewing the four screws A shown in Figure 5-1. Note that the bottom runners are held in place by the two lower screws.

8. Remove the gear plate assembly from the sub-panel by unscrewing the four screws B shown in Figure 5-1. As the assembly is lifted clear note the loose nut and washer on the lower axle and the two panel bearings and thin washers on the upper axle.

9. Slide the pointer out of the front panel extrusion. To do this one of the rollers at the ends of the extrusion must be removed. The pins which hold them in place are a press-fit in the extrusion and should be drifted out.

10. Remove all parts of the old cord.

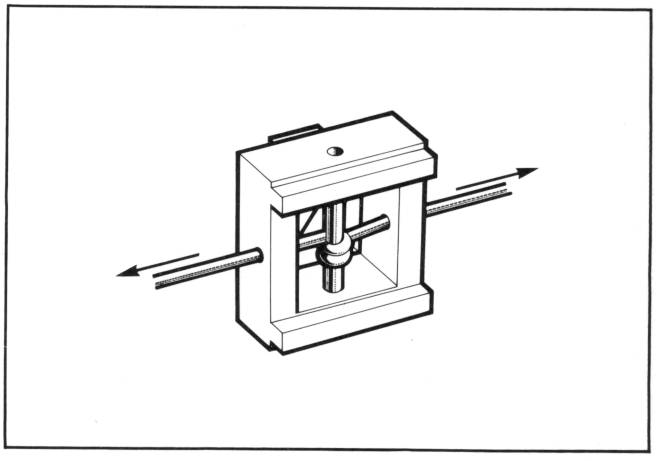


Figure 5-2 Restringing the Pointer

11. Using 20in (50cm) of cord restring the pointer as shown in Figure 5-2. Allow about 11.5in (29cm) of cord on the right side of the pointer when looking at the rear.

12. Replace the pointer in the front panel extrusion and refit the roller.

13. Pass the cord from the right side of the pointer (as viewed from the rear of the sub-panel/extrusion assembly) over the roller and pulley and through the hole in the flange at the front of the gear bobbin assembly. Double knot the end of the cord, apply a little adhesive to the knot, and pull the knot into the hole. Remove excess cord. Wrap four turns of cord onto the front of the bobbin, as shown in Figure 5-3.

14. Pass the cord from the left side of the pointer (as viewed from the rear of the sub-panel/extrusion assembly) over the roller and pulley through the hole in the gear and loop it round the cord grip screw. Do not tighten the screw at this stage. Wrap one turn onto the rear of the bobbin, as shown in Figure 5-3.

15. Set the gear bobbin assembly into the sub-panel, remembering to replace the panel bearing and thin washer.

16. Refit the gear plate assembly to the sub-panel — remember the nut and lockwasher on the lower axle and the thin washer and panel bearing on the upper axle.

17. Check that the cord is in the roller and pulley grooves and take up any slack. Tighten the cord grip screw and remove any excess cord.

18. Refit the sub-panel/extrusion assembly and nylon runners to the chassis. Use Loctite (*hp* Part Number 0470-0283) on the screws.

19. Refit the lever switch to the sub-panel.

20. Replace the front panel and panel bearing. To ensure correct alignment of the panel

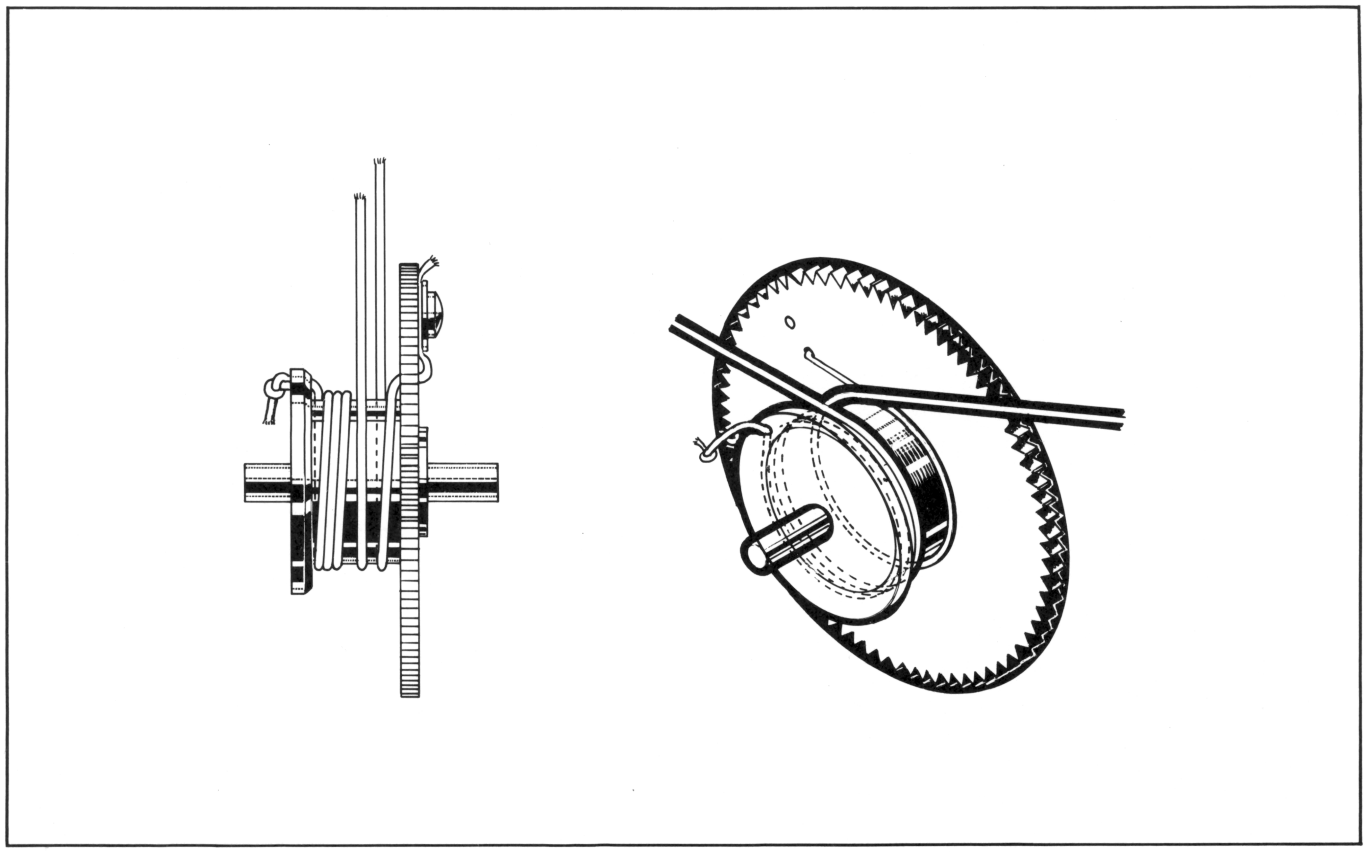


Figure 5-3 Restringing the Bobbin

bearing and hence smooth, easy pointer movement, grip the potentiometer drive coupling and rotate the axle to and fro whilst tightening the panel bearing.

21. Replace the two front panel knobs.

22. Check the pointer for smooth, easy movement and correct sense of movement. Any stiffness in the drive may be due to slight misalignment. This may be corrected by slackening the three screws and potentiometer stop bar which hold the gear plate in position. Check that the axle turns easily and retighten the screws and stop bar.

23. Replace the window and secure with the two set screws. Replace both window locks.

24. Set the pointer to 3.25GHz. Turn the potentiometer spindle fully anticlockwise and reconnect it to the drive shaft coupling, ensuring that the potentiometer stop bar is engaged in the slot in the stop plate.

25. Check that with the potentiometer set fully counterclockwise the pointer indicates 3.25GHz and when fully clockwise 5.05GHz. If necessary slacken the nut which holds the potentiometer to the stop plate and turn the potentiometer body to enable the correct settings to be obtained. Retighten the nut.

26. Replace the top and bottom panel and both side panels.

27. Recalibrate the Oscillator, as detailed in Section III of this manual.

5-10 THEORY OF OPERATION

5-11 The 3737A Oscillator is a plug-in for the Hewlett-Packard Model 3730A Down Converter.

5-12 The 3730A down-converts RF to IF by mixing the RF input signal with a signal from the Oscillator. The mixer output frequency is equal to the difference between the frequencies of the RF input and the Oscillator output.

5-13 Normally the mixer output centre frequency is 70MHz. To prevent the centre frequency drifting from 70MHz an automatic frequency control (AFC) system in the 3730A can be switched into operation. With this system slow changes, but not sweep changes, in the centre frequency are compensated for by a 3730A output tuning the Oscillator frequency.

5-14 The 3737A is a YIG (yttrium iron garnet) tuned transistor oscillator. The frequency can be tuned by controlling the tuning coil current. In the 3737A the current is controlled by an operational amplifier whose inputs come from the AFC output from the 3730A, from the front-panel range selector switch, and via a buffer from the front-panel INPUT FREQUENCY control. These inputs are summed by the operational amplifier to give an output to the YIG oscillator proportional to the required frequency. Note that because of the signal polarities the Oscillator output must be 70MHz less than that of the RF input to the 3730A. The output from the YIG oscillator is fed through a 3dB attenuator to a rear-panel connector on the 3737A and then to the mixer in the 3730A.

5-15 TROUBLESHOOTING

5-16 The troubleshooting information given here deals only with the 3737A Oscillator. When a fault is suspected and it is uncertain whether it is the Down Converter or the Oscillator that is at fault, refer to the troubleshooting information in the Down Converter Service Manual. Sufficient information is given there to diagnose the faulty instrument.

5-17 The Oscillator troubleshooting procedure is based on signal and power level measurements made at various frequencies. It should be remembered that the procedure is only a guide to troubleshooting.

5-18 Equipment Required

5-19 Equipment required for troubleshooting is listed in the Recommended Test Equipment table in Section I of this manual. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended models.

5-20 Troubleshooting Procedure

1. Remove the top panels from the Down Converter and Oscillator.

2. Plug the Oscillator into the Down Converter and switch on. Allow at least 15 minutes warm-up time.

DANGER

115/230V AC WIRES ARE EXPOSED WHEN THE TOP PANEL OF THE DOWN CONVERTER IS REMOVED. USE EXTREME CAUTION DURING TROUBLESHOOTING.

3. Monitor the power supplies in the Oscillator. The voltages should be as indicated in Table 5-1 below.

Table 5-1 Power Supply Voltage Measurements

Test Point	Voltage
TP4	+20V ±5%
CR2(c)	+14.7V ±5%
TP2	-15V ±5%
TP1	-10V ±5%
CR3(a)	-6.2V ±5%

4. Measure the voltage on TP3 with the frequency set to 3.3, 5.0, 4.8 and then 6.5GHz. It should be as detailed in Table 5-2.

5. If the voltage on TP3 is not correct unsolder the wire from the YIG oscillator to XA1 Pin N and link Pins S and N of XA1. Remonitor TP3. If the voltage is now correct then the YIG oscillator is faulty and should be replaced. However, if the voltage is still not correct the fault is on the YIG driver assembly. To pinpoint the trouble monitor the other test points listed in Table 5-2 with the frequency set to 3.3, 5.0, 4.8 and then 6.5GHz. When the test is complete remove the link and reconnect the YIG oscillator.

6. If the voltage on TP3 as measured in Step 4 of this procedure is correct then the YIG driver assembly is operating satisfactorily and the fault is probably in the YIG oscillator itself. Before checking the YIG oscillator output, monitor the supplies to the YIG. The voltages should be as detailed in Table 5-3. To check the power level of the YIG oscillator output first switch off the Down Converter and unplug the Oscillator. Remove from the Down Converter the U-shaped semi-rigid coaxial cable W913 which connects the Oscillator output to the mixer. Connect the test cable (*hp* Part Number 15558A) to J4 in its place. Plug the Oscillator back into the Down Converter and switch on. Allow adequate warm up time and then monitor the power output level. It should be +10 ±5dBm. When the test is complete, replace the U-shaped semi-rigid coaxial cable W913.

7. Replace the top panels of the Oscillator and Down Converter.

Table 5-3 YIG Oscillator Measurements

Test Point	Voltage
E1(1)	-10V ±5%
E1(2)	-10V ±5%
E1(3)	See Table 5-2, Q1(c)
E1(4)	+20V ±5%
E1(7)	0V
E1(8)	+20V ±5%

Table 5-2 Test Point Measurements

Test Point	Voltage*			
	3.3GHz	5.0GHz	4.8GHz	6.5GHz
TP3	+1.9V	+2.9V	+2.8V	+3.9V
IC1(6)	-0.1V	6.0V	-0.1V	-6.0V
IC2(6)	+3.0V	+4.1V	+4.0V	+5.1V
Q1(c)	+15.7V	+13.9V	+14.0V	+12.2V

***The figures quoted are typical**

5-21 CIRCUIT DESCRIPTION

5-22 The frequency of the YIG oscillator can be tuned by controlling the tuning coil current. The function of the YIG Driver Assembly is to control this current.

5-23 There are three inputs to the YIG Driver Assembly. One, the AFC input, is derived from the 3730A and is proportional to the IF output from the mixer. When the AFC switch on the 3730A is set to ON, the AFC input tunes the frequency of the Oscillator such that the IF output from the mixer is held at 70MHz. When the AFC switch is set to OFF, the AFC input is held at a fixed potential by a bias network in the 3730A.

5-24 The second input, from the front panel switch S1, is used to select the frequency range of the Oscillator. This is done by applying a bias to the input resistors R3 + R8 or R4 + R9. Variable resistors R3 and R4 are used to set the low frequency ends of the scales.

5-25 The third input, from the INPUT FREQUENCY control, is used to manually set the frequency of the Oscillator. The control is buffered from the input resistors R5 + R10 or R6 + R10 by IC1. Variable resistors R5 and R6 are used to set the high frequency ends of the scales.

5-26 The three inputs are summed by operational amplifier IC2. The output from IC2 controls the Darlington pair Q1 and Q2 which, in turn, the current through the tuning coil of the YIG oscillator.

5-27 Positive power supplies for the YIG Driver Assembly and the YIG oscillator are derived from the "floating" 20V supply from the 3730A. Negative power supplies are derived from the -15V supply from the 3730A.

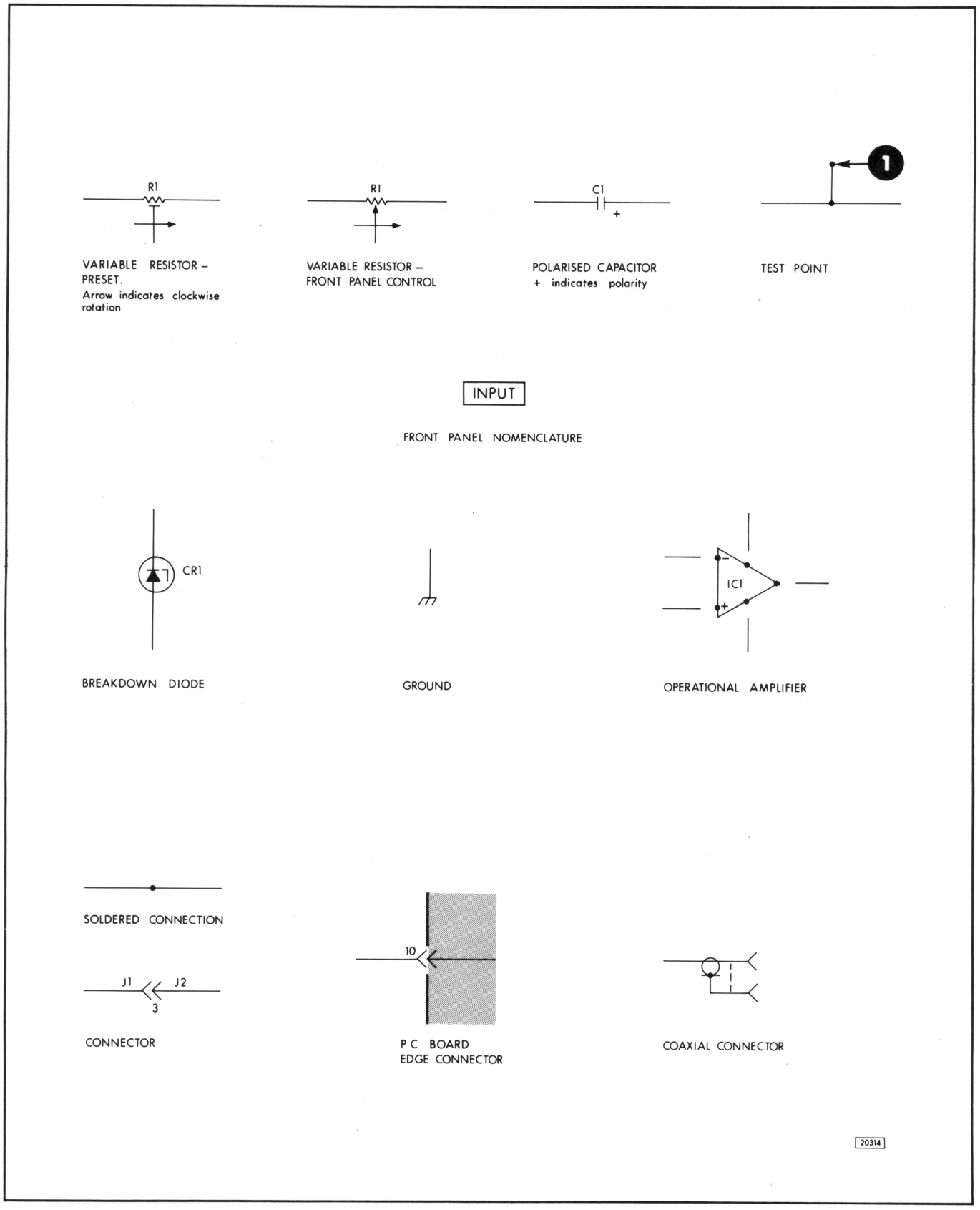
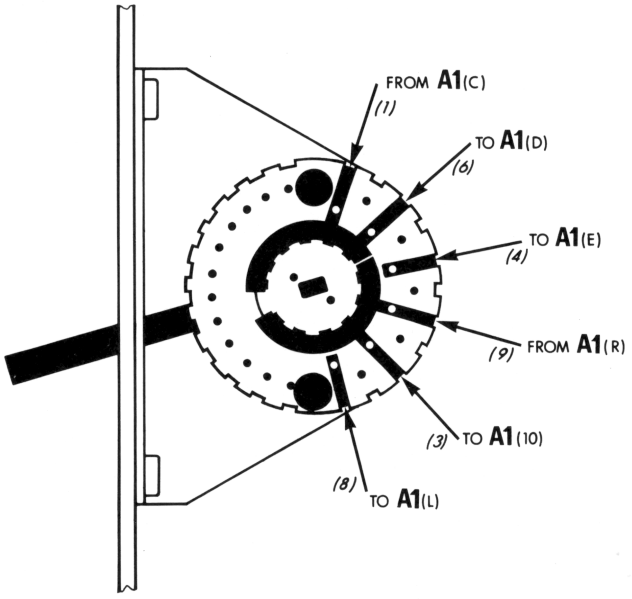
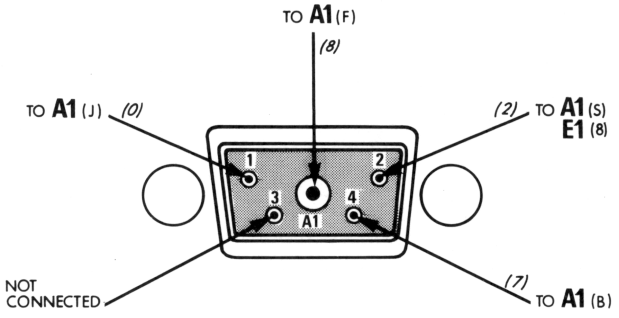


Figure 5-4 Schematic Symbols



SWITCH SHOWN IN 4·8 - 6·5GHz POSITION

Figure 5-5 Lever Switch Wiring



J1

VIEWED FROM BACK PANEL

Figure 5-6 Rear Panel Multi Connector Wiring

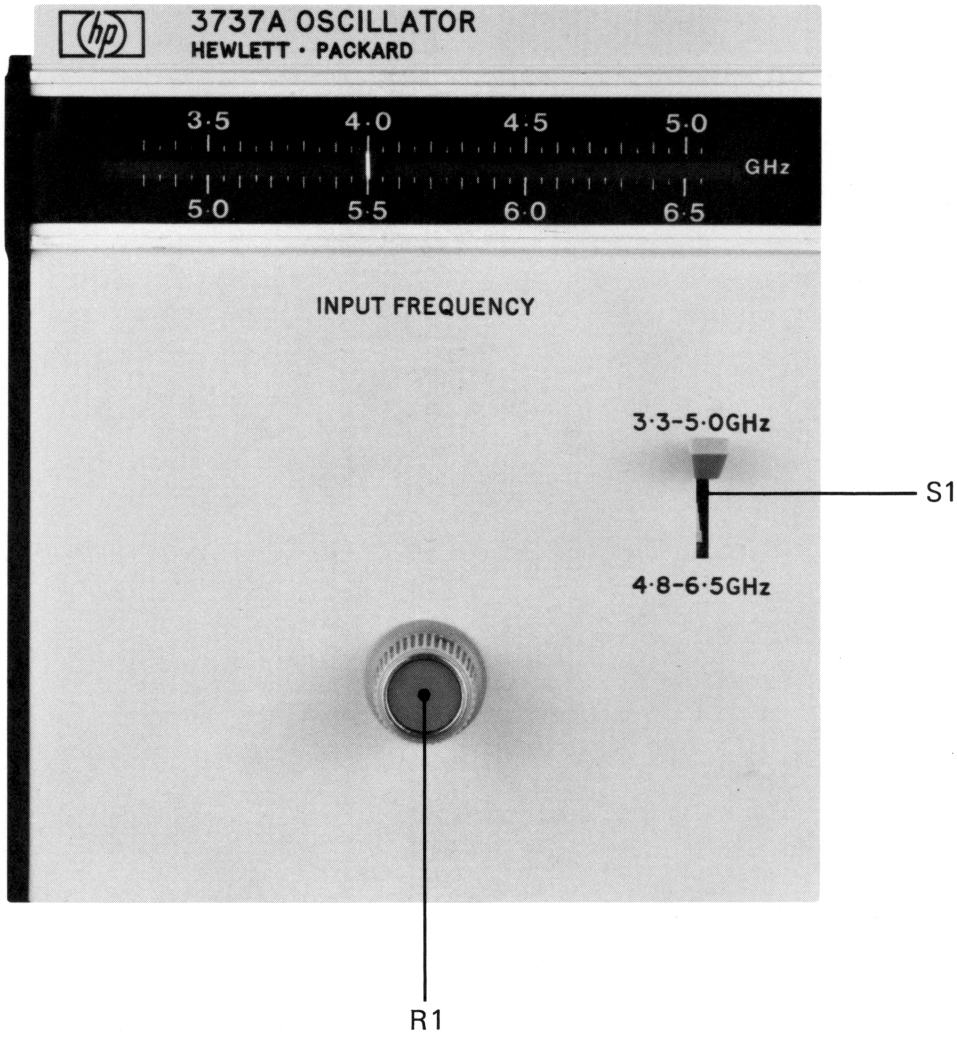


Figure 5-7 Component Location, Front Panel

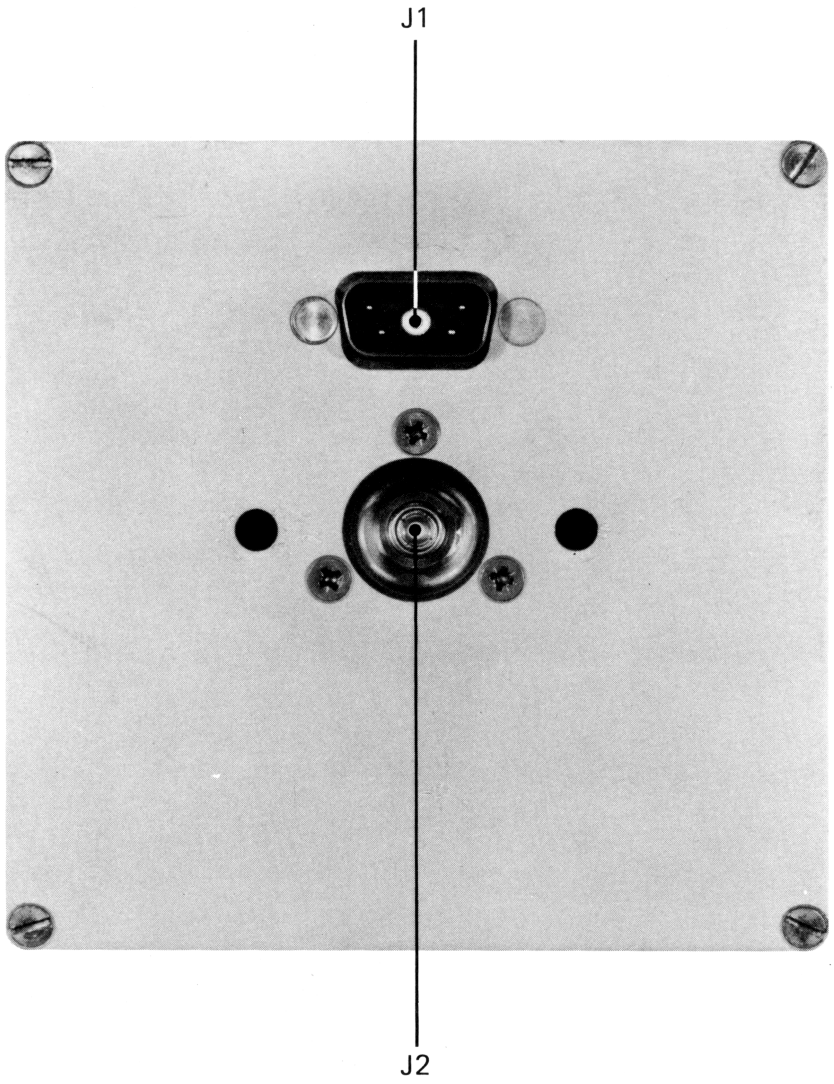


Figure 5-8 Component Location, Rear Panel

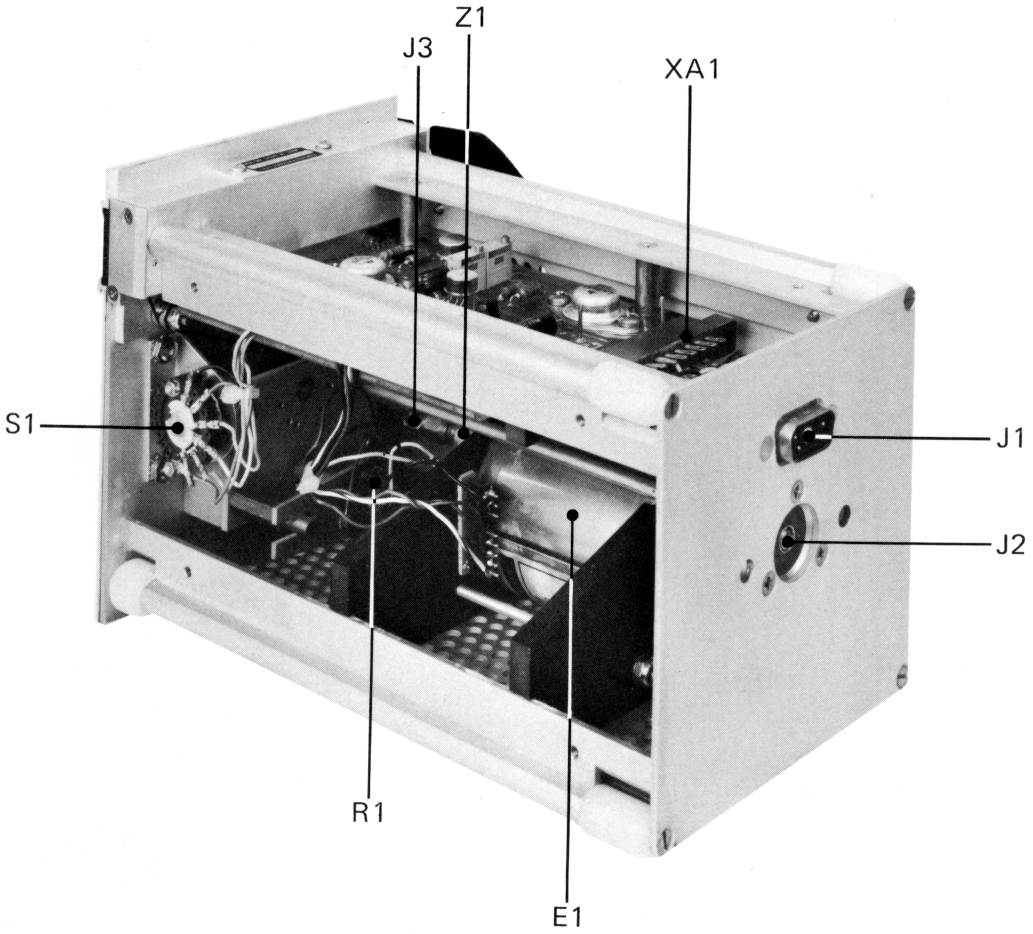


Figure 5-9 Component Location, Chassis Mounted Components

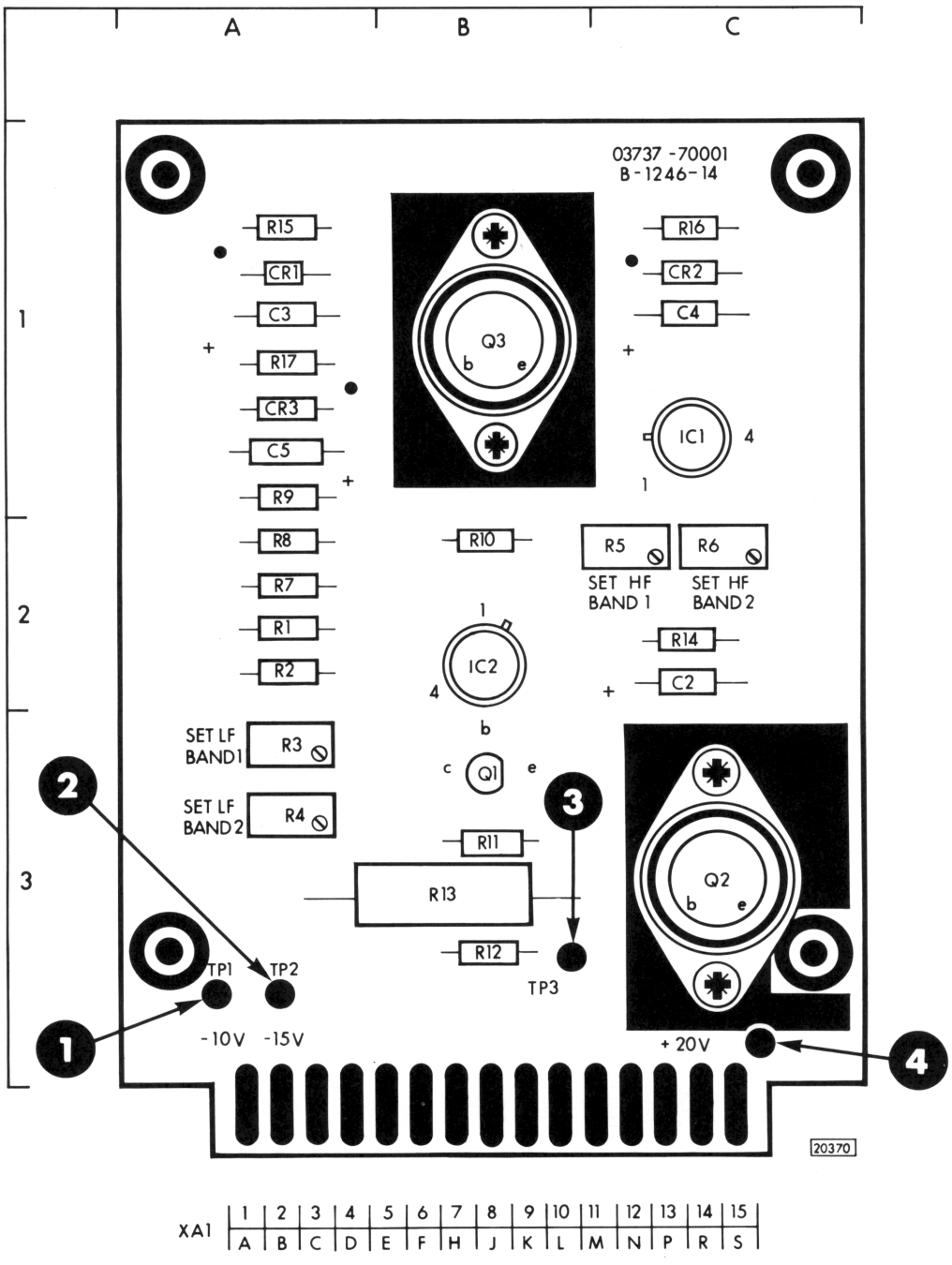


Figure 5-10 Component Location, A1

Table 5-4 Component Identification Grid, A1

C		R	
REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1		R1	A-2
C2	C-2	R2	A-2
C3	A-1	R3	A-3
C4	C-1	R4	A-3
C5	A-1	R5	C-2
		R6	C-2
CR		R7	A-2
REF DESIG	GRID LOC	R8	A-2
CR1	A-1	R9	A-1
CR2	C-1	R10	B-2
CR3	A-1	R11	B-3
		R12	B-3
IC		R13	B-3
REF DESIG	GRID LOC	R14	C-2
IC1	C-1	R15	A-1
IC2	B-2	R16	C-1
		R17	A-1
Q			
REF DESIG	GRID LOC		
Q1	B-3		
Q2	C-3		
Q3	B-1		

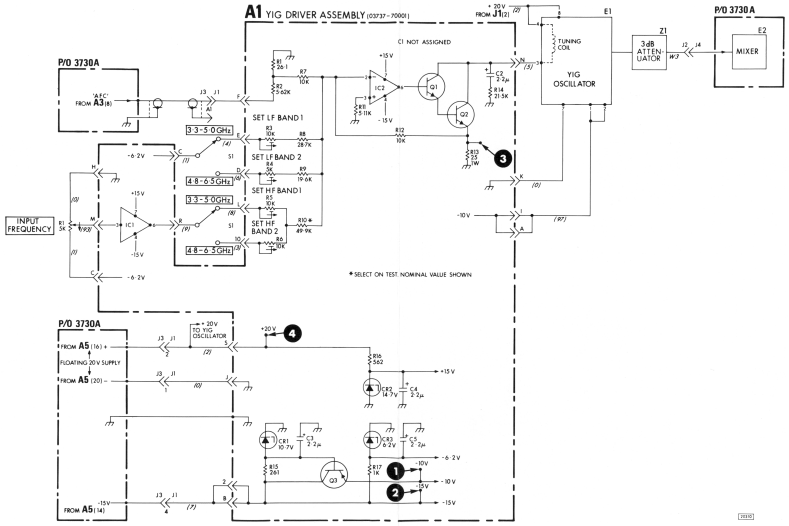


Figure 5-11 Schematic, 3737A Oscillator

HEWLETT hp PACKARD

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Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.
R. Barbosa Rodrigues, 42-1°DT.°
Caixa Postal, 6487
Luanda
Tel: 35515/6
Cable: TELECTRA Luanda

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Hewlett-Packard Australia Pty. Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
P.O. Box 36
Doncaster East, Victoria 3109
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Telex: 31-024
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Pymble
New South Wales, 2073
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Telex: 21561
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Parkside, 5063, S.A.
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Telex: 82536 ADEL
Cable: HEWPARD ADELAIDE

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Telex: 93859 PERTH
Cable: HEWPARD PERTH

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Teachers Union Building
495-499 Boundary Street
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Tel: 646-4513
Cable: EARMED Guam

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Connalight Centre
39th Floor
Connaught Road, Central
Hong Kong
Tel: H-255291-5
Telex: 74766 SCHMC HX
Cable: SCHMIDTCO Hong Kong

INDIA
Blue Star Ltd.
Kasturi Buildings
Jamshedji Tata Rd.
Bombay 400 020
Tel: 29 50 21
Telex: 2156
Cable: BLUEFROST

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
Bombay 400 025
Tel: 45 78 87
Telex: 4093
Cable: FROSTBLUE

Blue Star Ltd.
Band Box House
Prabhadevi
Bombay 400 025
Tel: 45 73 01
Telex: 3751
Cable: BLUESTAR

Blue Star Ltd.
14/40 Civil Lines
Kanpur 208 001
Tel: 6 88 82
Telex: 292
Cable: BLUESTAR

Blue Star Ltd.
7 Hare Street
P.O. Box 506
Calcutta 700 001
Tel: 23-0131
Telex: 7655
Cable: BLUESTAR

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Blue Star House,
34 Mahatma Gandhi Rd.
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